Configuration Manual

MSc Research Project
Programme Name

Oluseye Jerome Arinde
Student ID: X20121598

School of Computing
National College of Ireland

Supervisor: Rohit Verma

National College of Ireland

MSc Project Submission Sheet

School of Computing

Student Name: Oluseye Jerome Arinde

Student ID: X20121598

Programme: Cybersecurity **Year:** 2021/2022

Module: Internship

Lecturer: Rohith Verma

Submission Due Date: 19/9/2022……………………………………………………………….………

Project Title: IMPROVING SECURITY AND DATA PRIVACY OF eHEALTH APPLICATION IN THE CLOUD USING FEDERATED AND DEVICE-BASED AUTHENTICATION.

Word Count: 876 **Page Count: 13**

I hereby certify that the information contained in this (my submission) is information pertaining to research I conducted for this project. All information other than my own contribution will be fully referenced and listed in the relevant bibliography section at the rear of the project.
ALL internet material must be referenced in the bibliography section. Students are required to use the Referencing Standard specified in the report template. To use other author's written or electronic work is illegal (plagiarism) and may result in disciplinary action.

Signature: Oluseye Jerome Arinde………………………………………………

Date: 19/9/2022………………………………………………………………………………

PLEASE READ THE FOLLOWING INSTRUCTIONS AND CHECKLIST

Attach a completed copy of this sheet to each project (including multiple copies)	□
Attach a Moodle submission receipt of the online project submission, to each project (including multiple copies).	□
You must ensure that you retain a HARD COPY of the project, both for your own reference and in case a project is lost or mislaid. It is not sufficient to keep a copy on computer.	□

Assignments that are submitted to the Programme Coordinator Office must be placed into the assignment box located outside the office.

Office Use Only	
Signature:	
Date:	
Penalty Applied (if applicable):	

Configuration Manual

Oluseye Jerome Arinde
X20121598

This configuration manual shows the implementation of a federated authentication system architected in a secured cloud environment. It also shows the analysis done with the data of hospital visits.

1 **Software Requirement**

- Ubuntu 20.04 LTS
- Virtual environment for Python
- Python 3.9
- Django Framework
- Django-allauth
- Sqlite database

1.1 Setup a secured lab with virtual box Version 6.1

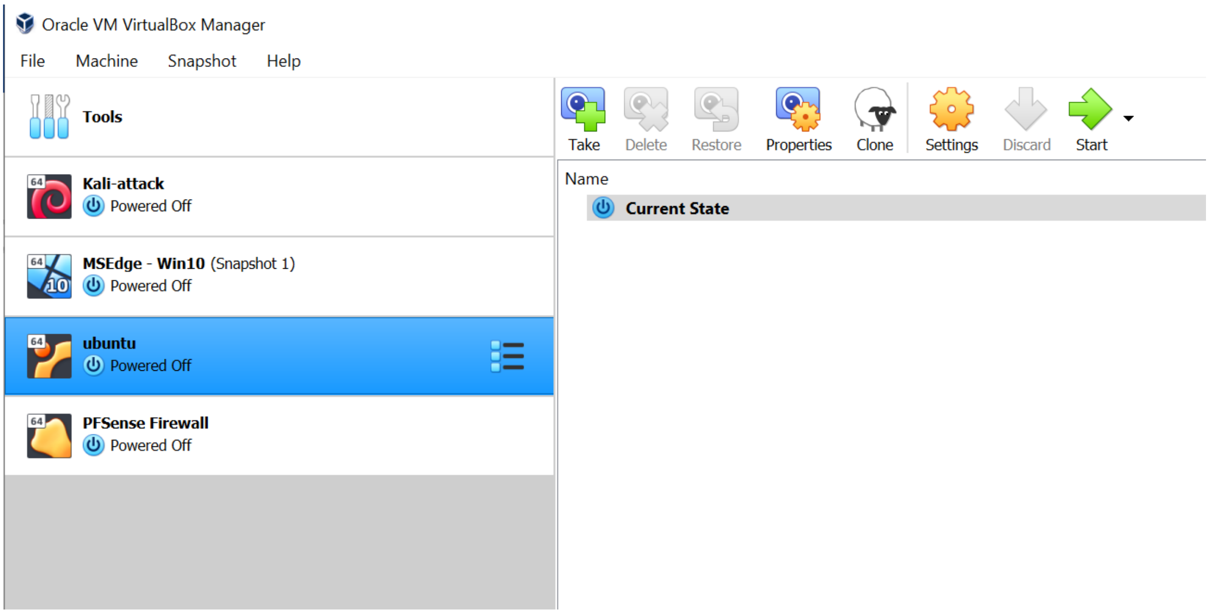
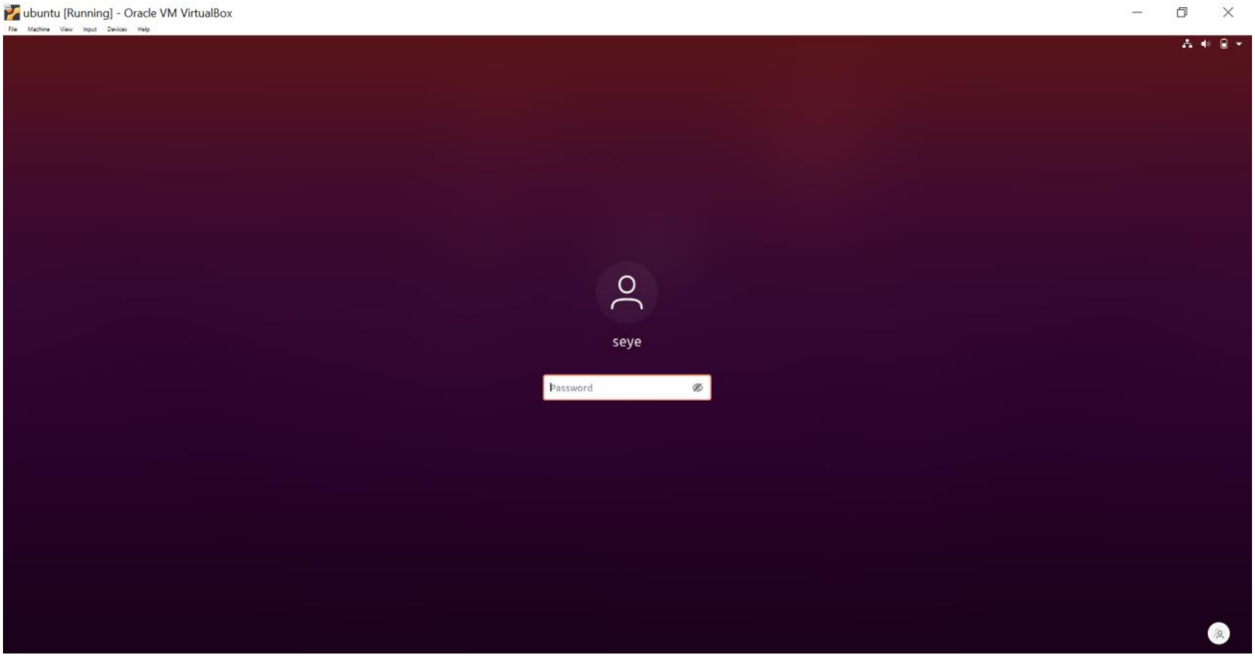


Figure 1: Lab setup on VirtualBox

1.2 Ubuntu OS

- Download and install Ubuntu Desktop Operating System from https://ubuntu.com/download/desktop
- Install Ubuntu 20.04 LTS
- Update all security repositories



Installation of Ubuntu OS

Figure 2: Installation of Ubuntu OS

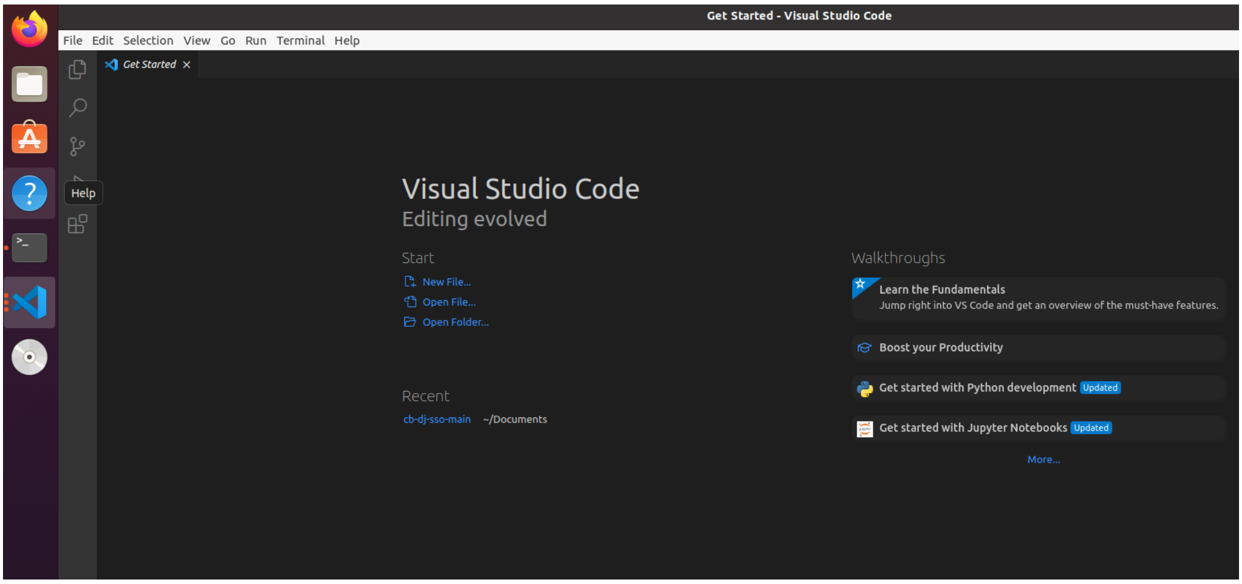
1.3 Visual studio

Download and install latest visual studio code editor from the official website

https://code.visualstudio.com/docs/setup/linux

After the download install in the Ubuntu OS with the command

```
sudo apt install ./<downloaded file>.deb
```

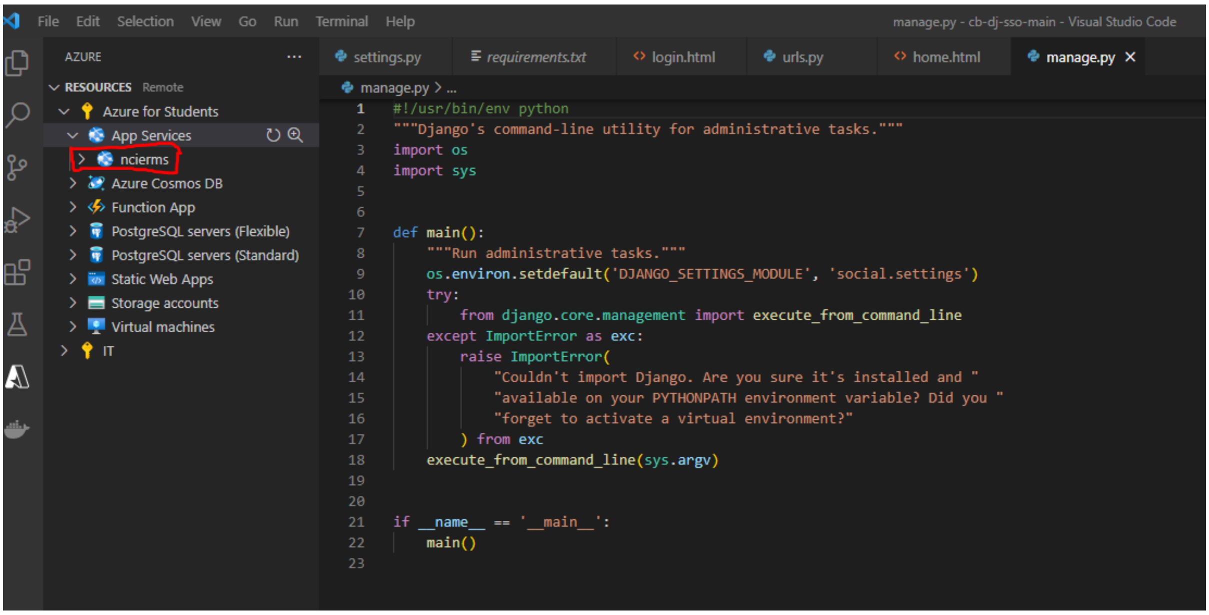

Get Started - Visual Studio Code
File Edit Selection View Go Run Terminal Help
Get Started
Help
Visual Studio Code
Editing evolved
Start
New File...
Open File...
Open Folder...
Recent
cb-dj-sso-main ~/Documents
Walkthroughs
Learn the Fundamentals
Boost your Productivity
Get started with Python development Updated
Get started with Jupyter Notebooks Updated
More...

Jump right into VS Code and get an overview of the must-have features.

Figure 3: Setting up of the development

1.4 From extensions menu on vscode, python, Django, intellisense, and Azure extensions are added to VScode.

1.5 Azure App service is also and connected to the azure cloud account provided for students at NCI.



```python
#!/usr/bin/env python
"""Django's command-line utility for administrative tasks."""
import os
import sys


def main():
    """Run administrative tasks."""
    os.environ.setdefault('DJANGO_SETTINGS_MODULE', 'social.settings')
    try:
        from django.core.management import execute_from_command_line
    except ImportError as exc:
        raise ImportError(
            "Couldn't import Django. Are you sure it's installed and "
            "available on your PYTHONPATH environment variable? Did you "
            "forget to activate a virtual environment?"
        ) from exc
    execute_from_command_line(sys.argv)


if __name__ == '__main__':
    main()

```

Figure 4: Installing Azure web apps and connecting to azure cloud

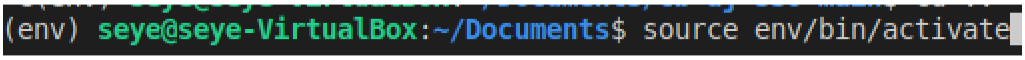
Right click on AppService and Create new app which is named **“ncierms”** This handles the deployment of the local application to the azure environment

2.0 After the development environment has been prepared Next is the Installation of virtual environment using the command “**python3 -m venv env”.**

Virtual environment is important to isolate the application, and to improve the code maintainability, versioning and reusability.

To activate the virtual environment:

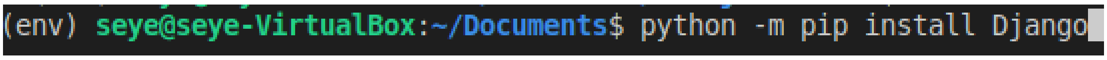
The virtual environment created is named “**env**” and to activate this environment, use the command source **env/bin/activate** this activate the “env” virtual environment as shown in the picture below



```
(env) seye@seye-VirtualBox:~/Documents$ source env/bin/activate
```

Figure 5: Activation of virtual development environment

2.1 Install Django in the virtual environment **“env”**



```
(env) seye@seye-VirtualBox:~/Documents$ python -m pip install Django
```

Figure 6: Installation of Django, the Python web development framework

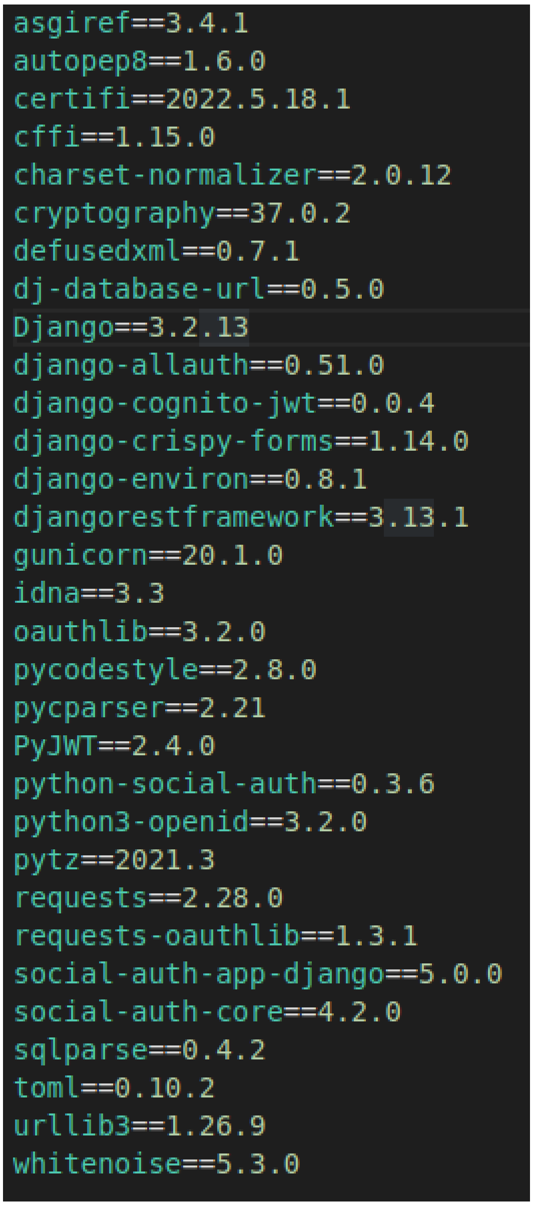
2.2: An open-sourced project was cloned as baseline to be enhanced for the implementation of a federated authentication. Here below is the link of the cloned project.
(Anikkadan, 2022)

https://github.com/akjasim/cb-dj-sso

2.3 **Installation of Django Allauth** The guide by “Readthedocs” was followed to install and setup connection to the IdP using facebook as the option here among other available IdP.

Command: pip install django-allauth

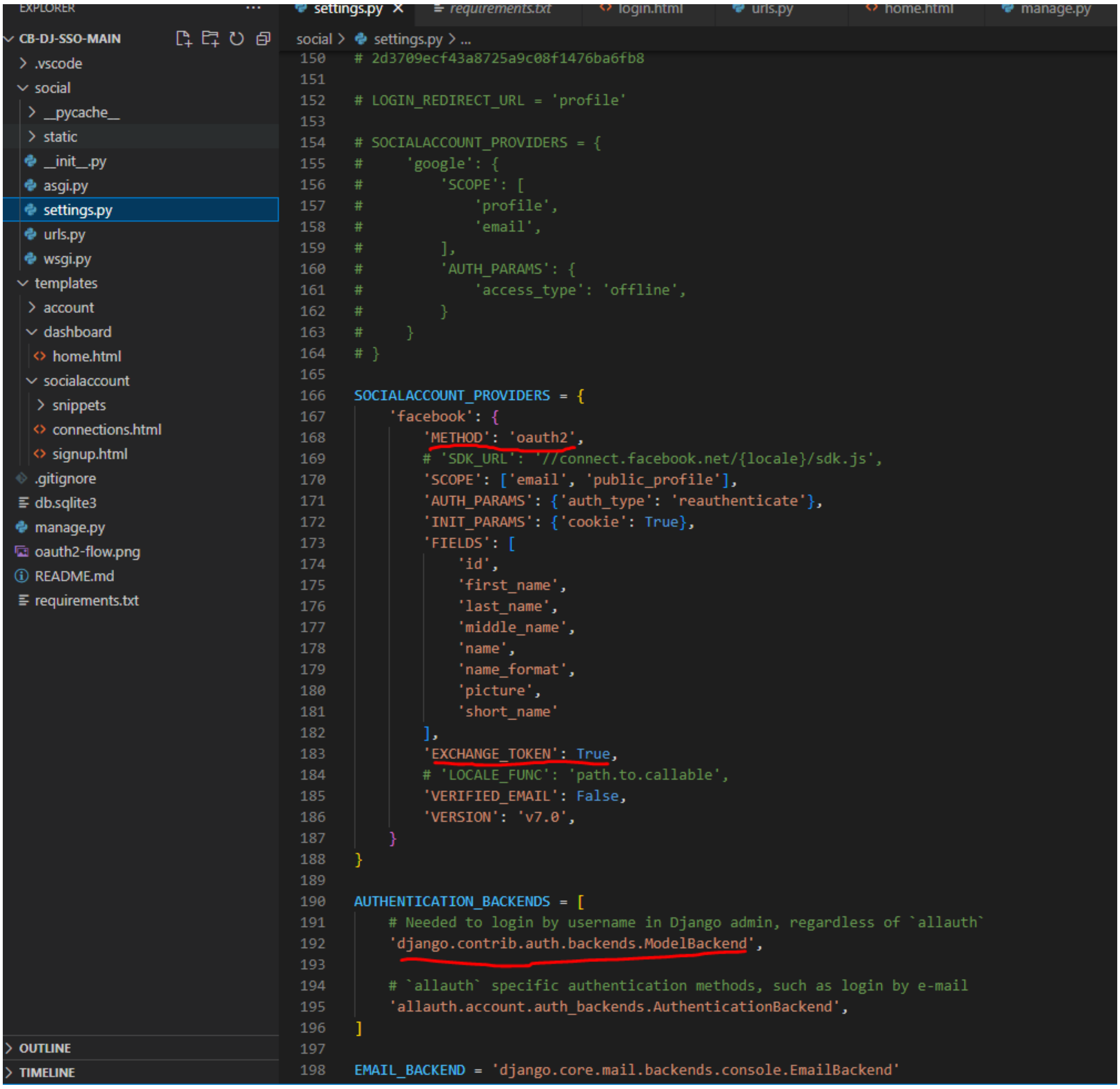
pip: -r requirements.txt



```
asgiref==3.4.1
autopep8==1.6.0
certifi==2022.5.18.1
cffi==1.15.0
charset-normalizer==2.0.12
cryptography==37.0.2
defusedxml==0.7.1
dj-database-url==0.5.0
Django==3.2.13
django-allauth==0.51.0
django-cognito-jwt==0.0.4
django-crispy-forms==1.14.0
django-environ==0.8.1
djangorestframework==3.13.1
gunicorn==20.1.0
idna==3.3
oauthlib==3.2.0
pycodestyle==2.8.0
pycparser==2.21
PyJWT==2.4.0
python-social-auth==0.3.6
python3-openid==3.2.0
pytz==2021.3
requests==2.28.0
requests-oauthlib==1.3.1
social-auth-app-django==5.0.0
social-auth-core==4.2.0
sqlparse==0.4.2
toml==0.10.2
urllib3==1.26.9
whitenoise==5.3.0
```

Figure 7: Installation of project application dependencies and applications

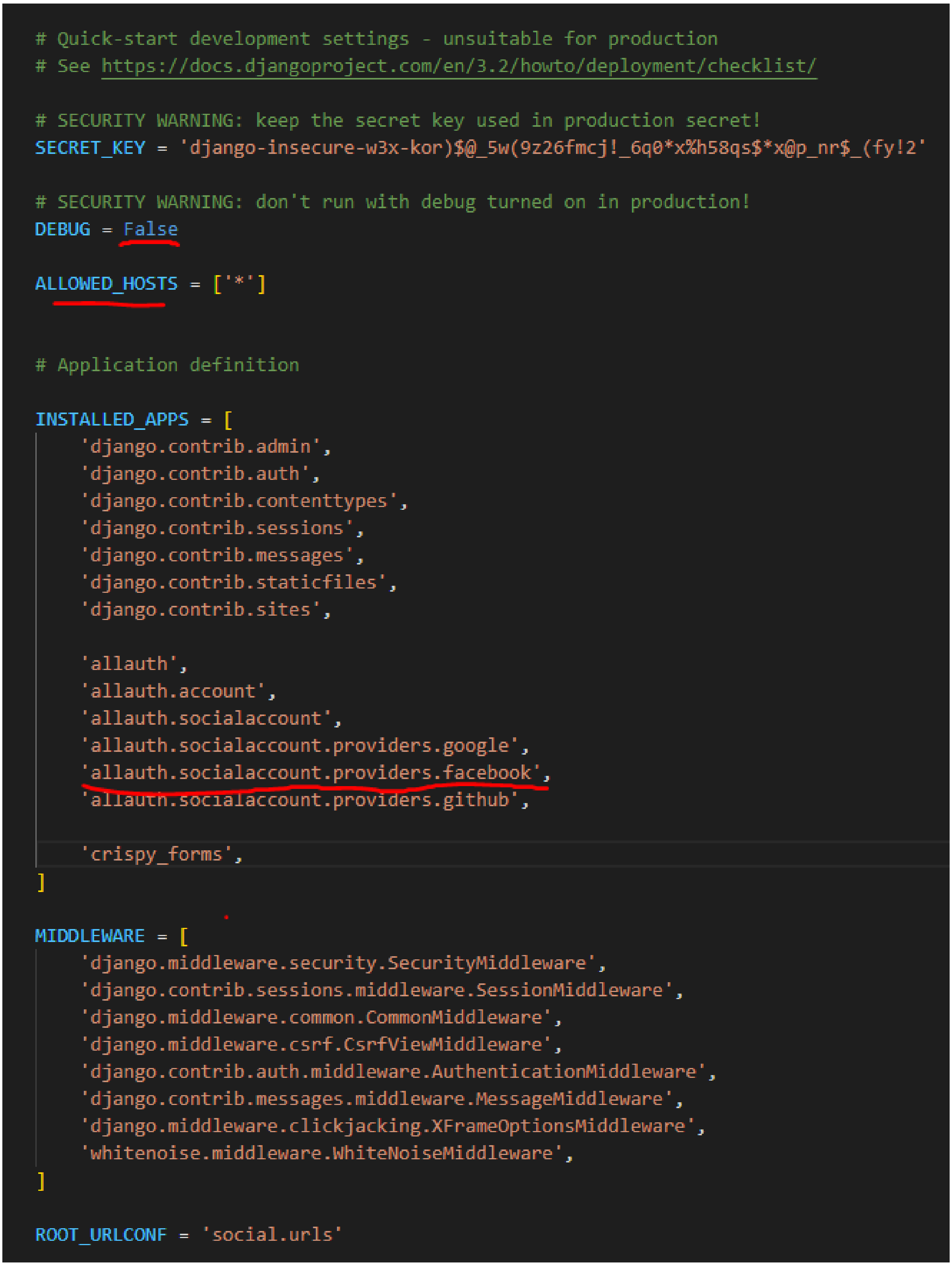
Below are the configuration settings of the Django settings.py



```
# 2d3709ecf43a8725a9c08f1476ba6fb8

# LOGIN_REDIRECT_URL = 'profile'

# SOCIALACCOUNT_PROVIDERS = {
#     'google': {
#         'SCOPE': [
#             'profile',
#             'email',
#         ],
#         'AUTH_PARAMS': {
#             'access_type': 'offline',
#         }
#     }
# }

SOCIALACCOUNT_PROVIDERS = {
    'facebook': {
        'METHOD': 'oauth2',
        # 'SDK_URL': '//connect.facebook.net/{locale}/sdk.js',
        'SCOPE': ['email', 'public_profile'],
        'AUTH_PARAMS': {'auth_type': 'reauthenticate'},
        'INIT_PARAMS': {'cookie': True},
        'FIELDS': [
            'id',
            'first_name',
            'last_name',
            'middle_name',
            'name',
            'name_format',
            'picture',
            'short_name'
        ],
        'EXCHANGE_TOKEN': True,
        # 'LOCALE_FUNC': 'path.to.callable',
        'VERIFIED_EMAIL': False,
        'VERSION': 'v7.0',
    }
}

AUTHENTICATION_BACKENDS = [
    # Needed to login by username in Django admin, regardless of `allauth`
    'django.contrib.auth.backends.ModelBackend',

    # `allauth` specific authentication methods, such as login by e-mail
    'allauth.account.auth_backends.AuthenticationBackend',
]

EMAIL_BACKEND = 'django.core.mail.backends.console.EmailBackend'
```

Figure 8: Project Configuration settings in file settings.py

With Allauth fully setup, debug settings turned off, and allowed host settings set to allow all (only for development environment)

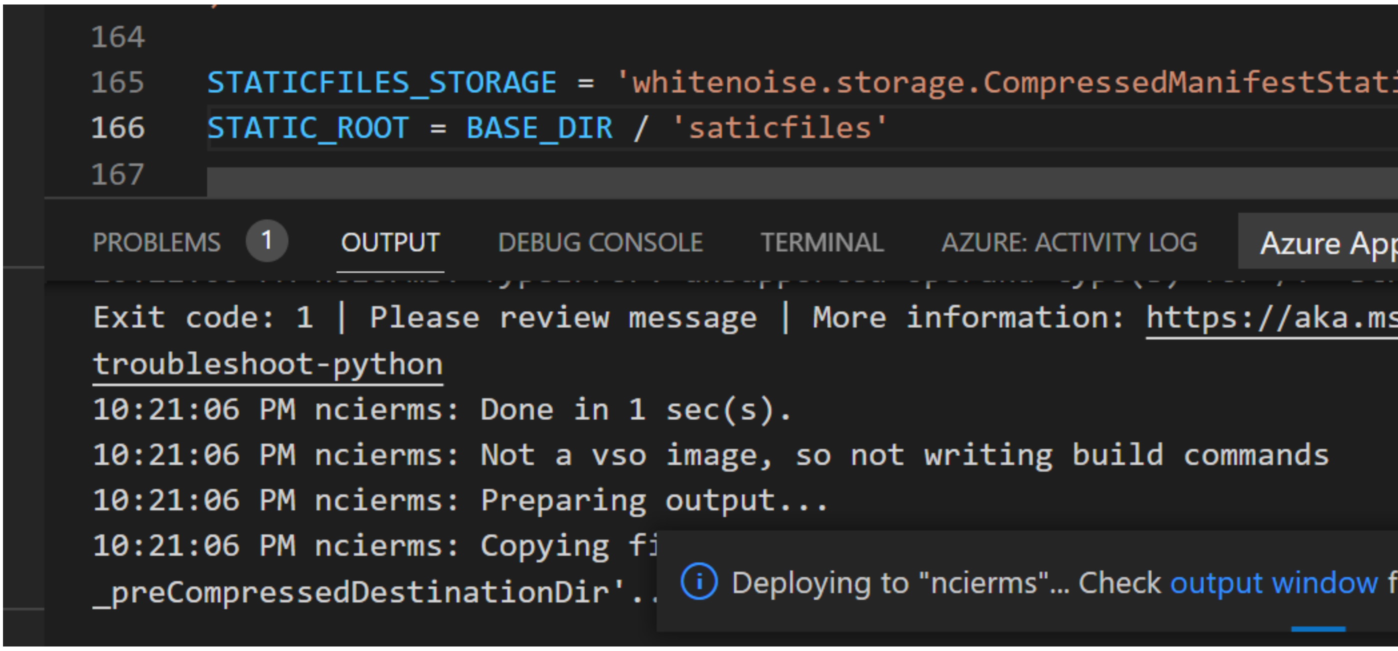


```python
# Quick-start development settings - unsuitable for production
# See https://docs.djangoproject.com/en/3.2/howto/deployment/checklist/

# SECURITY WARNING: keep the secret key used in production secret!
SECRET_KEY = 'django-insecure-w3x-kor)$@_5w(9z26fmcj!_6q0*x%h58qs$*x@p_nr$_(fy!2'

# SECURITY WARNING: don't run with debug turned on in production!
DEBUG = False

ALLOWED_HOSTS = ['*']


# Application definition

INSTALLED_APPS = [
    'django.contrib.admin',
    'django.contrib.auth',
    'django.contrib.contenttypes',
    'django.contrib.sessions',
    'django.contrib.messages',
    'django.contrib.staticfiles',
    'django.contrib.sites',

    'allauth',
    'allauth.account',
    'allauth.socialaccount',
    'allauth.socialaccount.providers.google',
    'allauth.socialaccount.providers.facebook',
    'allauth.socialaccount.providers.github',

    'crispy_forms',
]

MIDDLEWARE = [
    'django.middleware.security.SecurityMiddleware',
    'django.contrib.sessions.middleware.SessionMiddleware',
    'django.middleware.common.CommonMiddleware',
    'django.middleware.csrf.CsrfViewMiddleware',
    'django.contrib.auth.middleware.AuthenticationMiddleware',
    'django.contrib.messages.middleware.MessageMiddleware',
    'django.middleware.clickjacking.XFrameOptionsMiddleware',
    'whitenoise.middleware.WhiteNoiseMiddleware',
]

ROOT_URLCONF = 'social.urls'
```

Figure 9: Getting the application ready to be migrated to Azure Cloud

2.4 Deployment to Cloud

After testing the web application in the development environment, The app mapped with the web app created on Azure Cloud and pushed through the code deployment pipeline created with the Azure extension on VS Code.



```
STATICFILES_STORAGE = 'whitenoise.storage.CompressedManifestStati
STATIC_ROOT = BASE_DIR / 'saticfiles'
```

```
Exit code: 1 | Please review message | More information: https://aka.ms
troubleshoot-python
10:21:06 PM ncierms: Done in 1 sec(s).
10:21:06 PM ncierms: Not a vso image, so not writing build commands
10:21:06 PM ncierms: Preparing output...
10:21:06 PM ncierms: Copying fi
_preCompressedDestinationDir'..
```

Deploying to "ncierms"... Check output window f

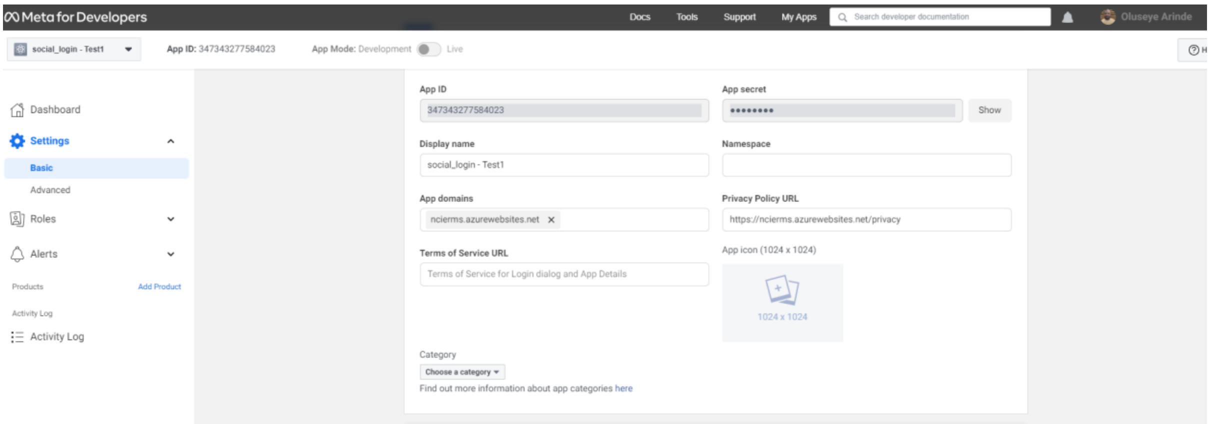
https://ncierms.azurewebsites.net/

Figure 10: Web application ncierms deployed to Azure Cloud

2.5 Integrating with the Facebook authentication API

This process detailed the setting up of federated integration of the ncierms with the Facebook authentication API

A test app was created on https://developers.facebook.com the app is named “social_login-Test1”



App ID: 347343277584023

App Mode: Development Live

App ID: 347343277584023

App secret: ••••••••

Display name: social_login - Test1

Namespace:

App domains: ncierms.azurewebsites.net ×

Privacy Policy URL: https://ncierms.azurewebsites.net/privacy

Terms of Service URL: Terms of Service for Login dialog and App Details

App icon (1024 x 1024): 1024 x 1024

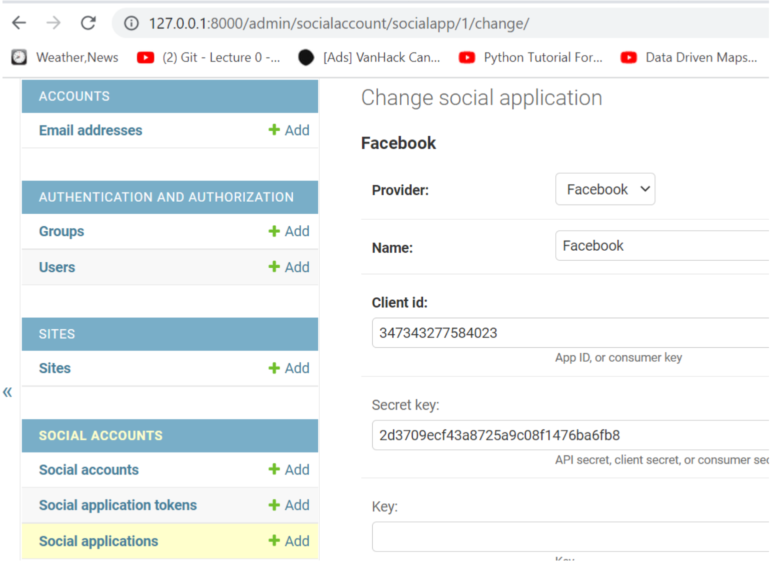
Category: Choose a category

Find out more information about app categories here

Figure 11: Integrating with Facebook authentication API

2.5.1

- Application ID and secret is setup on Django admin dashboard



Change social application

Facebook

Provider: Facebook

Name: Facebook

Client id: 347343277584023

App ID, or consumer key

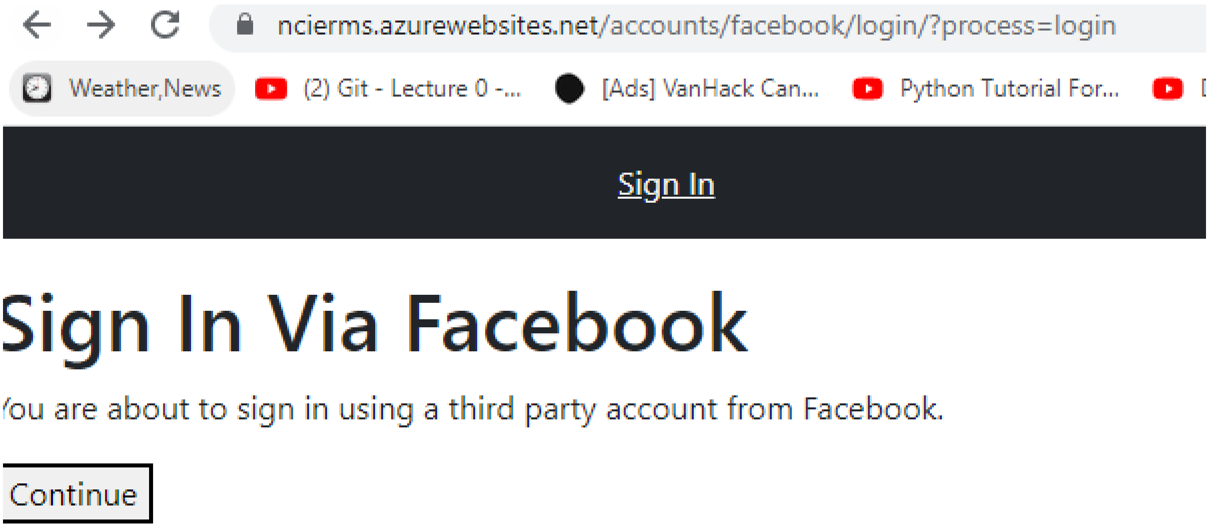
Secret key: 2d3709ecf43a8725a9c08f1476ba6fb8

API secret, client secret, or consumer sec

Key:

Figure 12: Adding Client ID and Secret Key parameters from Facebook Authentication API to the ncierms

And that connects the authentication app with the facebook IdP API



Sign In Via Facebook

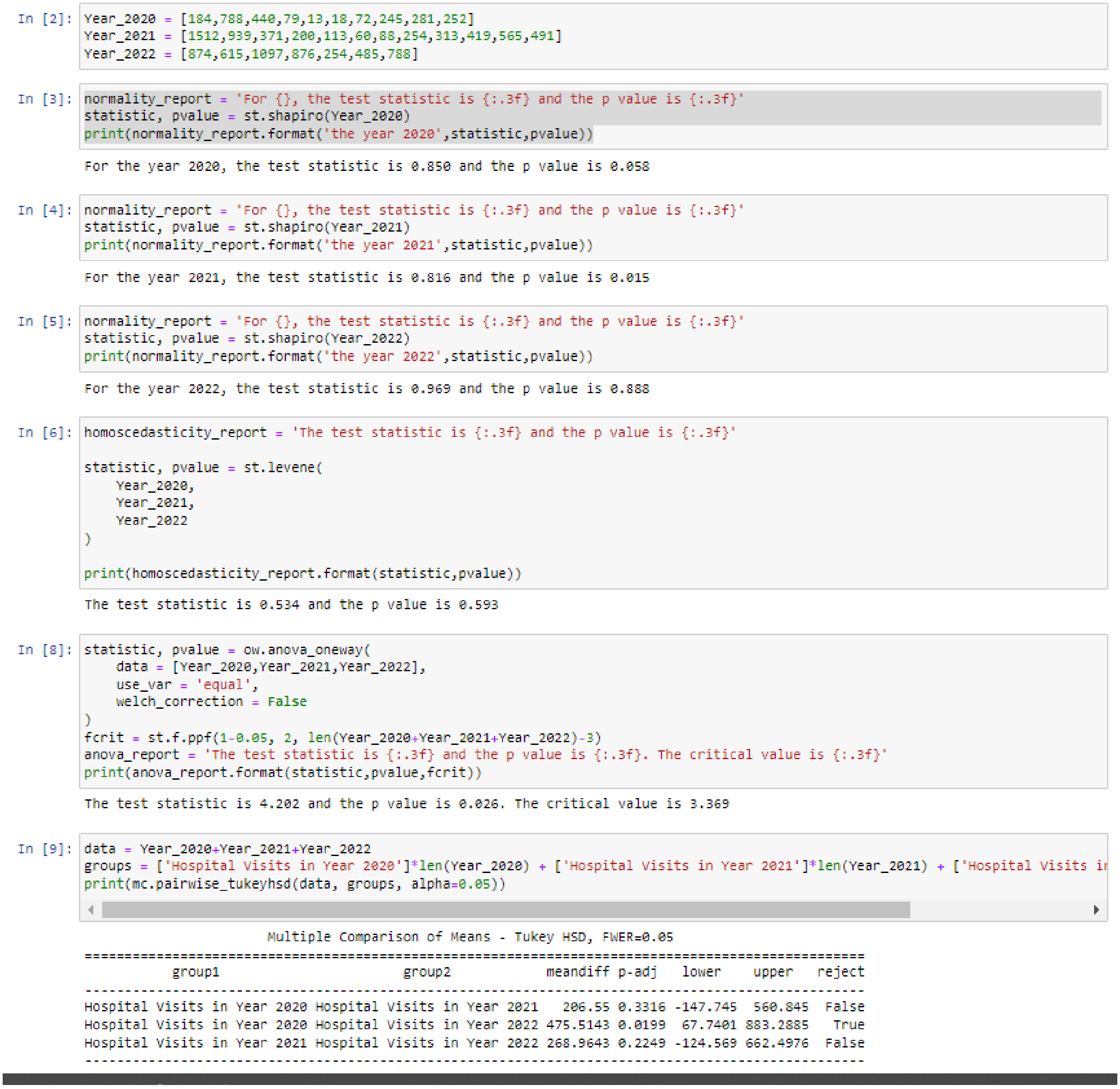
'ou are about to sign in using a third party account from Facebook.

Figure 13: Integration of ncierms with Facebook is tested.

Section 2:

To ascertain the change in the influx of patients in Irish hospitals between the years 2020, 2021 and 2022. Data is collected from the European centre for disease prevention control website. (ECDC, 2022) . The data is collected in a Microsoft excel sheet and processed in the Jupyter notebook. This test justifies this research as covid and other factors may have led to the increase in hospital visits between the years sampled; this has also necessitated the need for health care organization to migrate and secure infrastructure

ANOVA: The test for normalcy and analysis of variance in hospital daily visits between the years 2020, 2021 and 2022 is depicted in the code below.



```
In [2]: Year_2020 = [184,788,440,79,13,18,72,245,281,252]
        Year_2021 = [1512,939,371,200,113,60,88,254,313,419,565,491]
        Year_2022 = [874,615,1097,876,254,485,788]

In [3]: normality_report = 'For {}, the test statistic is {:.3f} and the p value is {:.3f}'
        statistic, pvalue = st.shapiro(Year_2020)
        print(normality_report.format('the year 2020',statistic,pvalue))

        For the year 2020, the test statistic is 0.850 and the p value is 0.058

In [4]: normality_report = 'For {}, the test statistic is {:.3f} and the p value is {:.3f}'
        statistic, pvalue = st.shapiro(Year_2021)
        print(normality_report.format('the year 2021',statistic,pvalue))

        For the year 2021, the test statistic is 0.816 and the p value is 0.015

In [5]: normality_report = 'For {}, the test statistic is {:.3f} and the p value is {:.3f}'
        statistic, pvalue = st.shapiro(Year_2022)
        print(normality_report.format('the year 2022',statistic,pvalue))

        For the year 2022, the test statistic is 0.969 and the p value is 0.888

In [6]: homoscedasticity_report = 'The test statistic is {:.3f} and the p value is {:.3f}'

        statistic, pvalue = st.levene(
            Year_2020,
            Year_2021,
            Year_2022
        )

        print(homoscedasticity_report.format(statistic,pvalue))

        The test statistic is 0.534 and the p value is 0.593

In [8]: statistic, pvalue = ow.anova_oneway(
            data = [Year_2020,Year_2021,Year_2022],
            use_var = 'equal',
            welch_correction = False
        )
        fcrit = st.f.ppf(1-0.05, 2, len(Year_2020+Year_2021+Year_2022)-3)
        anova_report = 'The test statistic is {:.3f} and the p value is {:.3f}. The critical value is {:.3f}'
        print(anova_report.format(statistic,pvalue,fcrit))

        The test statistic is 4.202 and the p value is 0.026. The critical value is 3.369

In [9]: data = Year_2020+Year_2021+Year_2022
        groups = ['Hospital Visits in Year 2020']*len(Year_2020) + ['Hospital Visits in Year 2021']*len(Year_2021) + ['Hospital Visits i
        print(mc.pairwise_tukeyhsd(data, groups, alpha=0.05))

                           Multiple Comparison of Means - Tukey HSD, FWER=0.05
        ===================================================================================================
                   group1                       group2             meandiff p-adj   lower    upper   reject
        ---------------------------------------------------------------------------------------------------
        Hospital Visits in Year 2020 Hospital Visits in Year 2021   206.55 0.3316 -147.745  560.845  False
        Hospital Visits in Year 2020 Hospital Visits in Year 2022 475.5143 0.0199  67.7401 883.2885   True
        Hospital Visits in Year 2021 Hospital Visits in Year 2022 268.9643 0.2249 -124.569 662.4976  False
        ---------------------------------------------------------------------------------------------------
```

Figure 14: Test of Variance in Hospital visits between the years 2020, 2021 and 2022

References

Anikkadan, M.J., 2022. Django SSO using Google, Facebook and GitHub.

ECDC, E., 2022. Data on hospital and ICU admission rates and current occupancy for COVID-19 [WWW Document]. Eur. Cent. Dis. Prev. Control. URL https://www.ecdc.europa.eu/en/publications-data/download-data-hospital-and-icu-admission-rates-and-current-occupancy-covid-19 (accessed 8.12.22).